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New tricyclic thiochromenone derivatives as metabotropic glutamate receptor-1 (mGluR1) antagonists useful for treating e.g. hemorrhagic stroke and atherosclerosis, especially pain or neurodegenerative diseases

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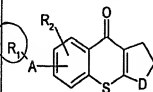
#### 4NOVELTY

Tricyclic thiochromenone derivatives (I) are new.

#### DETAILED DESCRIPTION

Thiochromenones of formula (I) and their salts, hydrates and/or solvates are new;

B(6-B2, 14-A1, 14-A2, 14-C1, 14-F5, 14-F12, 14-F2D1, 14-F4, 14-F7, 14-F8, 14-F10, 14-G2D, 14-H1, 14-J1A, 14-J1B, 14-J5, 14-J7, 14-L6, 14-M1, 14-N1, 14-N16, 14-S1, 14-S4) .12



$R_1 - OH$   
(I) *novant*

$R_1$  is (i) 6-10C aryl or 5-10 membered heteroaryl (both optionally substituted (as) by one or more of halo, CHO, CONH<sub>2</sub>, CN, OH, OCF<sub>3</sub>, NO<sub>2</sub>, NR<sub>4</sub>, tetrazolyl or alkoxycarbonyl; or alkyl, alkoxy, 1-6C acyl or alkylthio (all as by OH, morpholinyl, 1-6C acyloxy or halo)); (ii) 3-12 membered carbocyclyl or 4-2 membered heterocyclyl (both as by one or more of alkyl, alkoxy, 1-6C acyl, alkoxycarbonyl or oxo); or (iii) R<sub>2</sub>-E;  
A = direct bond, O, S, NR<sub>4</sub>, CO, SO, SO<sub>2</sub>, SO<sub>2</sub>O, CONR<sub>4</sub>, SO<sub>2</sub>NR<sub>4</sub>, OSO<sub>2</sub>, NR<sub>4</sub>CO, NR<sub>4</sub>SO<sub>2</sub>, R<sub>1</sub>SO<sub>2</sub>O, NR<sub>4</sub>SO<sub>2</sub>NR<sub>4</sub> or

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NR<sub>4</sub>CONR<sub>4</sub>; or R<sub>1</sub>A = H or NH<sub>2</sub>; R<sub>3</sub>, R<sub>4</sub> = H, alkyl or 1-6C acyl;

E = optionally unsaturated 1-10C alkanediyl;

R<sub>5</sub> = H, CONH<sub>2</sub>, halo, OH, NO<sub>2</sub>, CF<sub>3</sub>, NH<sub>2</sub>, mono- or dialkylamino, alkoxy, 6-10C aryl, 5-10 membered heteroaryl or 4-10 membered heterocyclyl (as by oxo and/or alkyl and optionally benzo-fused), where aryl, heteroaryl and benzo groups are as by halo, CN, CF<sub>3</sub>, OCF<sub>3</sub>, NO<sub>2</sub> or alkyl;

R<sub>6</sub>-R<sub>15</sub> = 3-8C cycloalkyl or optionally unsaturated alkyl (as by OH, phenyl (as by halo or 1-4C alkyl), alkoxy, alkoxycarbonyl or cycloalkyl);

R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>-R<sub>12</sub>, R<sub>14</sub>, R<sub>15</sub> = H;

R<sub>2</sub> = H, halo, or alkyl or alkoxy (both as by 1 or 2 of OH, alkoxy or mono- or dialkylamino);

D = 3-10C hydrocarbylene (as by F);

Alkyl moieties have 1-6C unless specified otherwise.

Provided that:

(1) the -R<sub>1</sub>A- group is in the 2- or 3-position of the thiochromenone ring; and

(2) the compound 2-chloro-6,7,8,9,10,10a-hexahydro-cyclohepta(b)thiochromen-11(Salt)-one is excluded.

#### ACTIVITY

Neuroprotective; Cerebroprotective; Immunosuppressive; Anticonvulsant; Antiarteriosclerotic; Antidyspeptic; Nootropic; Antiparkinsonian; Virucide; Antibacterial; Tranquillizer; Neuroleptic; Antidiabetic; Antiemetic; Anorectic; Antidiarrhetic; Analgesic.

#### MECHANISM OF ACTION

Metabotropic Glutamate Receptor-1 (mGluR1) receptor Antagonist.

In receptor binding assays using CHO cells expressing the mGluR1 receptor, 3-ethyl-6-(1H-tetrazol-5-yl)-1,2,3,4-tetrahydro-9H-thioxanthene-9-one (Ia) had an IC<sub>50</sub> of 9 nM.

#### USE

(I) are used as medicaments (claimed), useful for the treatment and/or prophylaxis of neuronal damage diseases or diseases associated with disorders of the glutamatergic system in the central and peripheral nervous system, specifically: (i) neuronal damage associated with ischemic, thrombotic, thrombo-embolic or hemorrhagic stroke, direct or indirect cerebral-cranial injury or post-operative cerebral ischemia; (ii) primary or secondary cerebral

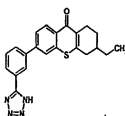
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disorders, e.g. associated with cerebral vasospasm, hypoxia/anoxia, prenatally asphyxia, autoimmune, metabolic or organ diseases, convulsions, atherosclerosis or arteriosclerosis; (iii) chronic or psychiatric disorders such as depression, neurodegenerative diseases (e.g. Alzheimer's disease, Parkinson's disease or Huntington's disease, multiple sclerosis, amyotrophic lateral sclerosis, neurodegeneration due to viral or bacterial infections or multi-infarct dementia; (iv) dementia of various origins, cerebral insufficiency in the elderly, memory disorders, bone marrow injury, anxiety states, drug-induced Parkinsonian syndrome, psychosis (e.g. schizophrenia), cerebral edema, neuronal damage after hypoglycemia, emesis, nausea, obesity, substance abuse and withdrawal symptoms, CNS-mediated spasms, sedation or movement disorders; or (v) acute and/or chronic pain, especially cancer-induced pain or chronic neuropathic pain. (I) are especially used for the treatment and/or prophylaxis of pain or neurodegenerative diseases (claimed).

#### SPECIFIC COMPOUNDS

165 Compounds (I) are disclosed, e.g. 3-ethyl-6-(1H-tetrazol-5-yl)-1,2,3,4-tetrahydro-9H-thioxanthene-9-one (Ia).



(Ia)

#### ADMINISTRATION

Dosage is 0.001-10 mg/kg, preferably 0.005-3 mg/kg in the case of oral administration. (I) are preferably administered orally, parenterally or transdermally, although inhalative or topical administration is also possible.

#### EXAMPLE

A mixture of 0.5 g 3-ethyl-9-oxo-2,3,4,9-tetrahydro-1H-thioxanthene-6-carbonitrile, 0.51 g triethylammonium hydrochloride

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and 0.24 g sodium azide was stirred in toluene overnight at 100 °C, cooled, stirred with water and toluene, acidified to pH 3 with hydrochloric acid and further stirred. The obtained solid was filtered off, washed with water, dried and recrystallized from cyclohexane/ethyl acetate to give 3-ethyl-6-(1H-tetrazol-5-yl)-1,2,3,4-tetrahydro-9H-xanthen-9-one (Ia; 290 mg; 50%).

## DEFINITIONS

### Preferred Definitions:

$R_1$  = (i) phenyl or 5- or 6-membered heteroaryl (both as by 1 or 2 of halo, CN or 1-3C alkyl); or (ii) 5-7 membered heterocyclyl (as by one or more of 1-3C alkyl or oxo);

A = direct bond,  $NR_4$ ,  $SO_2NR_4$  or  $NR_4CO$ ;

$R_4$ ,  $R_8$  = optionally unsaturated 1-3C alkyl (as by 1 or 2 of OH or OMe) or H;

$R_3$  = H;

D =  $(CH_2)_n-CH(R_{16}R_{17})(CH_2)_n$  (having a total of 3-6C);

m, n = 0-2;

$R_{16}$ ,  $R_{17}$  = H or 1-3C alkyl;

$CH(R_{16}R_{17})$  = 3-6C cycloalkylidene;

The  $-R_1A-$  group is in the 3-position.

## TECHNOLOGY FOCUS

Organic Chemistry - Preparation: (I) are generally prepared by introducing and/or modifying the group  $-AR_1$ . Typically a corresponding halo compound having  $-AR_1$  replaced by Br or Cl is reacted with:

- a boron compound of formula  $R_{19}BR_{20}R_{21}$  (III) in a solvent in presence of a catalyst (preferably under Suzuki coupling conditions) to give (I;  $-AR_1 = R_{19}$ );
- a heterocyclic compound of formula  $R_{22}H$  (IV) in a solvent to give (I;  $-AR_1 = R_{22}$ ); or
- an active hydrogen compound of formula  $R_1-G-H$  (V) in a solvent in presence of a catalyst to give (I;  $A = G$ ).

$R_{19}$  = as for  $R_1$  (i);

$R_{20}$ ,  $R_{21}$  = OH;

$BR_{20}R_{21}$  = 3,3,4,4-tetramethyl-1-bora-2,5-dioxacyclopentane;

$R_{22}$  = N-bonded 4-12 membered heterocyclyl (as as in  $R_1$  (ii));

G = O, S or  $NR_4$ ;

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